

REMARKS

STATUS OF THE CLAIMS

In accordance with the foregoing, claims 7 and 16 have been amended and claims 17 and 18 have been added. Claims 1-6, 10 and 13-15 have been cancelled. Claims 7-9, 11, 12 and 16-18 are pending and under consideration.

No new matter is being presented, and approval of the amended claims is respectfully requested.

OBJECTION TO CLAIMS 2, 5, 6 AND 8-16

On page 2 of the Action, the Examiner objects to claims 2, 5, 6 and 8-16 as being of improper dependent form for failing to further limit the subject matter of the previous claim.

Claims 2, 5, 6, 10 and 13-15 are cancelled herein and, thus, the objections thereto are considered moot.

Claim 8, for example, recites that the reference load of the mold clamping servomotor is an average value of a plurality of mold clamping forces acquired by performing a plurality of molding cycles. Therefore, claim 8 is further describing the reference load utilized by the mold clamping force adjusting means recited in independent claim 7.

Similarly, claims 9 and 11 and 12 depend from claim 7 and describe the load of the mold clamping servomotor. The features of claims 9, 11 and 12 provide further specifications for the mold clamping force adjusting means recited in independent claim 7.

Claim 16 depends from claim 7 and provide further specifications for the mold clamping force adjusting means recited in independent claim 7.

Therefore, the objections to claims 2, 5, 6 and 8-16 are respectfully overcome and should be withdrawn.

The Examiner additionally notes that if claim 3 is found to be allowable, claim 4 will be objected to as being a substantial duplicate thereof. However, as noted above, claims 3 and 4 are cancelled herein.

REJECTIONS OF CLAIMS 2, 5, 6 AND 8-16 UNDER 35 U.S.C. §112, SECOND PARAGRAPH

On page 3 of the Action, the Examiner rejects claims 2, 5, 6 and 8-16 as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention.

The Examiner further states that these claims only set forth recitations regarding the manner in which the claimed machine is to be utilized during the intended operation.

However, as stated above, claim 2, 5, 6, 10 and 13-15 are cancelled herein and, thus, the rejections thereof are considered moot.

As stated above, claim 8, 9, 11, 12 and 16 recite features of the mold clamping force adjusting means recited in independent claim 7.

The Examiner further states that claim 10 is unclear as to what is intended by the phrase "when the mold clamping force is unclamped".

Claim 10 is cancelled herein; however the features of claim 10 have been incorporated into amended independent claim 7, which is amended herein to recite "load detecting means for detecting a load acting on the mold clamping servo-motor during mold unclamping". Support for this amendment can be found in the Specification, at page 5, lines 21-23. Therefore, it is respectfully submitted that claim 7, as amended to include the features of claim 10, particularly points out and distinctly claims the subject matter of the invention.

Thus, the rejections of claims 2, 5, 6 and 8-16 are respectfully traversed and should be withdrawn.

REJECTIONS OF CLAIMS 1, 2 AND 13 FOR OBVIOUSNESS UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER EGGENBERGER ET AL. (U.S. PATENT NO. 3,642,405) OR SPECK ET AL. (U.S. PATENT NO. 4,832,884)

Claims 1, 2 and 13 are cancelled herein. Thus, the rejections thereof are considered moot.

REJECTIONS OF CLAIMS 3-12 AND 14-16 FOR OBVIOUSNESS UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER EGGENBERGER OR SPECK, IN VIEW OF ONISHI (U.S. PATENT NO. 6,413,453), HIRAOKA (U.S. PATENT NO. 5,912,025), SIEGRIST ET AL. (U.S. PATENT NO. 5,792,483) OR SILVEY (U.S. PATENT NO. 5,469,038)

Claims 3-6, 10 and 14-15 are cancelled herein; however, the features of claim 10 are incorporated into independent claim 7.

Speck et al. (hereinafter "Speck") discloses merely a method for measuring and controlling the closing force of a plastic injection molding machine. According to Speck, an accidental deviation of the closing force from the tolerance zone may be altered by measuring the closing force for each operating cycle of an operating period and computing a mean value. A measuring device measures the actual closing force and compares it to the mean value. If the values differ, control intervention by a servomotor takes place. (Column 1, line 35 – column 2, line 16).

Eggenberger et al. (hereinafter "Eggenberger") discloses a mold-closing device, using a hydraulic cylinder as a driving motor, with a toggle joint mechanism. The device of Eggenberger includes a shifting mechanism 50 operable to adjust the distance between stationary mold carrier plane 1 and joint plane 3. (Column 3, lines 45-48).

In contrast, amended independent claim 7 recites a toggle type mold clamping apparatus, disposed between a movable platen mounted with a movable side mold and a rear platen, moving the movable platen forward and rearward by a mold clamping servo-motor; load detecting means for detecting a load acting on the mold clamping servo-motor during mold unclamping; and mold clamping force adjusting means for adjusting a position of the rear platen according to a difference between a load of the mold clamping servo motor detected by said load detecting means every predetermined number of molding cycles, or an average of such loads, and a predetermined reference load of the mold clamping servomotor.

In other words, the present invention is characterized in that the load acting on the mold clamping servomotor applied during mold unclamping is detected and the position of the rear platen is determined based on the detected load on the mold clamping servomotor. In short, the position of the rear platen is determined at the IP(-) (mold unclamping), not IP(+) (mold clamping), as shown in Fig. 2. (See also page 13, lines 5-9).

Therefore, in the present invention, the data corresponding to the load after filling the resin into a cavity, is measured, so that the data on the load actually acting on a molded product can be obtained. As resin filling pressure may vary dependent upon the setting and state of injection and hold-pressure, measuring the mold clamping force actually acting on a molded product is significant, as compared with measuring the mold clamping force before completion of filling of resin into the mold cavity.

When the mold is closing, the mold cavity is not yet filled with resin, while when the mold is opening, the molded product is present in the mold cavity. Therefore, the present invention is capable of detecting a load acting on the mold clamping servo-motor during mold unclamping, while the mold cavity is filled with the resin.

It is respectfully submitted that neither Eggenberg nor Speck teach or even suggest the features of amended independent claim 7, as discussed above.

Moreover, on page 4 of the Action, the Examiner states that pressure cylinder actuators and servomotors are well-known equivalents for toggle clamping, and it would have been obvious to one of ordinary skill in the art to modify Eggenberg or Speck to use a servomotor.

Applicant respectfully disagrees.

In an apparatus where the driving force of the toggle mechanism is hydraulic pressure, the hydraulic pressure at a time of generation of the mold clamping force is merely compared with the measured hydraulic pressure obtained after adjustment of the mold clamping force is made. Adjustments to the hydraulic pressure can be made thereafter, depending on the difference. Thus, when using a pressure cylinder as the driving force, measuring and adjusting the clamping force are easily performed.

On the other hand, traditionally, when mold clamping is conducted using a servomotor as the driving force (as opposed to a pressure cylinder), the mold clamping is conducted by detecting a state of the toggle mechanism on the basis of a rotational position of the servomotor, to perform position control and to attain a locked position. However, when resin with high temperatures is injected into the molds, for example, the temperature of the molds rises so that the thickness of the mold fluctuates. As a result, since the mold clamping operation is controlled by a rotational position, the mold clamping force must be changed by a magnitude corresponding to the fluctuation of the thickness of the molds. (See the discussion on page 2, line 27 through page 4, line 4 of the Specification).

The present invention remedies this problem by providing a toggle type mold clamping apparatus using a servomotor as the mold clamping force, with mold clamping force adjusting means which adjusts a position of the rear platen according to a difference between a mold clamping force obtained by measurement every predetermined number of molding cycles or an average of such mold clamping forces and a predetermined reference mold clamping force.

Thus, the present invention provides an injection molding machine, using a toggle type mold clamping apparatus driven by a servomotor, capable of suppressing fluctuations of a mold clamping force during automatic operation thereof, so that a stable mold clamping force can be obtained.

Therefore, it is respectfully submitted that neither Eggenberger nor Speck, alone or in combination, teaches or suggests the features of independent claim 7.

It is further submitted that none of Onishi, Hiraoka, Siegrist et al. or Silvey teaches or suggests the features of independent claim 7.

Claims 8, 9, 11, 12 and 16-18 depend from claim 7 and inherit the patentable recitations thereof. Thus, it is respectfully submitted that dependent claims 7, 8, 9, 11, 12 and 16-18 patentably distinguish over the prior art.

CONCLUSION

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot. Further, all pending claims patentably distinguish over the prior art. There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

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